BEFORE THE

FEDERAL COMMUNICATIONS COMMISSION

In the Matter of	)	
	)	
International Comparison and Consumer	)	GN Docket No. 09-47
Survey Requirements in the Broadband	)	
Data Improvement Act	)	
	)	
A National Broadband Plan for Our Future	)	GN Docket No. 09-51
	)	
	)	GN Docket No. 09-137
	)	

Comments of the

National Rural Electric Cooperative Association

NBP PUBLIC NOTICE #2

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October 2, 2009

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SUMMARY

NRECA is the not-for-profit, national service organization representing nearly 930 not-for-profit, member-owned rural electric cooperative systems, which serve 42 million customers in 47 states. NRECA estimates that electric cooperatives own and maintain 2.5 million miles of electric power lines, yet average fewer than seven customers per mile of electric distribution line. NRECA fully supports the Administration's and Commission's goal of efficiently implementing Smart Grid technology. For more than three decades, Electric Co-ops have used smart grid and demand response technologies to improve reliability, increase energy and asset efficiency and to keep electric rates low. NRECA is pleased to have this opportunity to offer comments in this proceeding as the Commission works to implement a "smart" national broadband policy that will ensure electric cooperative efforts to modernize the electric grid are not abated by the lack of access to sufficient, secure and reliable grid communications.

NRECA urges the Commission to develop a "smart" national broadband policy that recognizes that: electric utilities require robust, secure and reliable communications networks ; current commercial networks are not ideally suited to meet these needs; the preferred networks are robust, private networks; and sufficient spectrum should be reserved to support further development of the Smart Grid.

The FCC's notice seeks answers to many important and valid questions. Solid first steps to begin to collect that information have been taken, but more time would be necessary to gather the type of comprehensive data being sought.

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Comments of the

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I. INTRODUCTION

The National Rural Electric Cooperative Association ("NRECA") appreciates this opportunity to comment in response to the Federal Communications Commission's ("FCC" or "Commission") General Notice regarding how advanced infrastructure and services can help achieve efficient implementation of Smart Grid technology. ("Notice").[1] NRECA is the not-for-profit, national service organization representing nearly 930 not-for-profit, member-owned rural electric cooperatives systems. Rural electric cooperatives ("Electric Cooperatives" or "Electric Co-ops") serve 18 million businesses, homes, schools, churches, farms and other establishments. More than 42 million consumer-owners in 47 states receive their electric service from a

[1] *Comment Sought on the Implementation of Smart Grid Technology," NBP Public Notice #2*, GN Docket Nos. 09-47, 09-51, 09-137, Public Notice, DA09-1842 (rel. Aug. 20, 2009) ("Notice").

A National Broadband Plan for the Future, GN Docket No. 09-51, Notice of Inquiry, 24 FCC Rcd 4342 (2009) [hereinafter "National Broadband Plan NOI"], available at http://hraunfoss.fcc.gov/edocs_public/attachmatch/FCC-09-31A1.pdf.

distribution cooperative. Electric Co-ops own and maintain 2.5 million miles, or 42%, of the nation's electric distribution lines, covering three quarters of the nation's land mass. Electric Co-ops average seven consumers and generate $10,656 of revenue per mile of line.[2]

NRECA's members also include approximately 65 generation and transmission ("G&T") cooperatives, which supply power to their distribution cooperative owner-members. Both distribution and G&T cooperatives were formed to provide reliable electric service to their owner-members at the lowest reasonable cost. Because of their mission, and their extremely low customer density, Electric Cooperatives have had to find creative solutions to maximize the efficiency of their far-flung systems.

NRECA fully supports the Administration's and Commission's goal of efficiently implementing Smart Grid technology. For more than three decades, Electric Co-ops have used smart grid and demand response technologies to improve reliability, increase energy and asset efficiency and to help keep electric rates low.[3] Indeed, *FERC's 2008 Assessment of Demand Response & Advanced Metering*[4] noted that cooperatives had a 16.4% penetration of advanced meters compared to the industry's average of 4.7%. Electric Co-ops also had 18% of the nation's demand response capability – a significant percentage, considering that Electric Co-ops sell only 10% of the nation's electricity.

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[2] By contrast, investor-owned utilities average 35 consumers and $62,665 in revenue per mile and municipally-owned utilities average 47 consumers and $86,302 in revenue per mile. NRECA Strategic Analysis comparison compiled from Rural Utilities Service and Energy Information Administration data.

[3] F.E.R.C. ANN. REP. ON THE ASSESSMENT OF DEMAND RESPONSE AND ADVANCED METERING 8 (Dec. 2008), available at http://www.ferc.gov/legal/staff-reports/12-08-demand-response.pdf (last viewed on 7/21/2009).

[4] Id. at p. 8. "Cooperatives deployed approximately 2.4 million advanced meters, accounting for 41 percent of the 5.8 million increase in advanced metering penetration since 2006. This deployment by cooperatives represents an increase of 360 percent from 3.8 percent penetration in 2006 to 16.4 percent in 2008. Over the same period, investor-owned utilities deployed approximately three million advanced meters, accounting for 46 percent of the 5.8 million total increase in advanced metering since the 2006 FERC Survey. Advanced metering penetration for investor-owned utilities shows an increase of 1,081 percent, from 0.2 percent penetration in 2006 to 2.7 percent in 2008."

Moreover, NRECA's internal analysis drawing on data from 2004 indicates that approximately half of the Electric Co-ops had installed at least some advanced metering infrastructure ("AMI") on their systems, arguably the central component of a Smart Grid.

Demonstrating their continued commitment to the deployment of Smart Grid technologies, approximately 300 Electric Cooperatives, directly or indirectly, have applied for Department of Energy ("DOE") Smart Grid Investment Grants. And, 27 Electric Cooperatives are participating in an ambitious NRECA-led DOE Smart Grid Demonstration Project proposal[5], which would install 131,720 smart meter modules, 18,480 demand response switches, 3,958 in-home displays/smart thermostats, 2,825 ZigBee gateways, 169 voltage sensors, and 247 fault detectors.

Electric Co-ops have not only embraced Smart Grid technologies, they also led the industry in promoting interoperability of system elements. About a decade ago, NRECA's Cooperative Research Network ("CRN") organized a number of vendors to work on developing a specification for software used by utilities known as MultiSpeak®. Software designed to the MultiSpeak® specification allows various utility systems – customer information, metering, outage management, etc. – to "talk" to one another without the need for expensive, custom interfaces. Electric Co-ops are also heavily involved with various efforts by the IEEE and others to harmonize communications standards that will facilitate interoperability of various Smart Grid devices.

NRECA urges the Commission to implement a "smart" national broadband policy that enhances the ability of Electric Cooperatives, and all other utilities, to continue the modernization of the electric transmission and distribution grids. A "smart" national broadband

[5] http://www.nreca.coop/main/NRECA/PressRoom/Releases/2009CRNDemoProject.htm

policy will recognize that the unique nature of the electric utility and other critical infrastructure ("CI") providers require communications networks that are specifically designed to meet the reliability, security and other performance needs of individual CI providers. In short, there is no magic "one size fits all." Further, the policy will recognize that current commercial networks are not ideally suited to meet the needs of CI. And, the policy will reflect that the preferred networks to support CI are robust, private networks operating over various communications platforms. Lastly, the policy will include the allocation of additional spectrum to support further development of the Smart Grid.

Comments

II. SUITABILITY OF COMMUNICATIONS TECHNOLOGIES

"In today's electric utility marketplace, real time information becomes the key factor for reliable delivery of power to the end users, profitability of the electric utility and customer satisfaction. Both operational and commercial demands of electric utilities require a high performance communication network not only to support existing functions, but also to support new operational requirements of future electric systems. Since the communications infrastructure constitutes the core of electric system automation applications, the design of a cost-effective and reliable network architecture is crucial."[6]

The answers to the FCC's questions regarding the suitability of the several communications technologies will necessarily vary from utility to utility. Because there is currently no single cost-effective communications solution for adequately enabling all potential Smart Grid applications, utilities will likely require hybrid communications networks to facilitate reliable communications throughout the entire electric grid. Generally, Electric Co-ops have three basic applications to satisfy current system needs, that is, before full implementation of the Smart Grid:

[6] National Electric Energy Testing, Research and Applications Center, *Communications Infrastructure for Electric System Automation*, NEETRAC Baseline Project Number: 04-157 (Sept. 2005) at p. 1 (on file with author). NRECA suggests NEETRAC to the Commission as an excellent source for more detailed information on network performance and characteristics.

1. Interoffice and Internet-based "high" bandwidth (greater than 500 kbps) links for limited locations;

2. Mobile links for voice and data traffic, at "medium" bandwidth (20 to 500 kbps), to, from, and between all fleet vehicles; and

3. Fixed network data traffic with varying bandwidths from high to "low" (20 kbps minimum) depending upon the specific utility application. For traditional operations data such as metering, SCADA, and substation/feeder automation, medium- and low-bandwidth technologies will suffice. For substations used as data concentration hubs, for video surveillance or for converting current PBX systems to VOIP, high bandwidths will be required.[7]

In comparing various communications options for suitability, Electric Co-ops consider certain factors abbreviated as "SLAC":

Security: The network should be resistant to malicious attacks. The more critical the operation of a particular system feature, the more secure the communications link serving that part of the system must be.

Latency: The network should not introduce significant delay in transmitting system control and data signals—delay that could render control, particularly, ineffective. For certain critical facilities and equipment, the measurement of time is in milliseconds.

Availability: The network should be reliable. Downtime for maintenance and repair should be minimal.

Cost: Total costs – purchase price, installation, and maintenance – should be reasonable and in proportion to the benefits the network provides.

There is another consideration that bears mentioning as well – reliability. The application of mandatory reliability standards for owners, operators and users of the bulk electric power system has certainly emphasized the importance of total system reliability for utilities. Violation of these standards can subject a utility to significant financial penalties. While the mandatory

[7] Id. For many years, the fixed network will be a hybrid of technology components. For example, a co-op may have deployed a PLC-based AMI system with a couple of substation-based backhaul networks that serve as shared-hubs for AMI and SCADA data.

standards set by the North American Electric Reliability Corporation ("NERC") and approved by the Federal Energy Regulatory Commission do not specifically address communications network functions and capabilities, a properly functioning and secure communications network will be a necessary component to achieving compliance with certain NERC standards.

A. Question 1.a. What are the specific network requirements of reach application in the grid (e.g,. latency, bandwidth, reliability coverage, others)? If these differ by application, how do they differ?

NRECA's Cooperative Research Network has been helping electric cooperatives assess their system requirements against the various types of communications platforms. Below is a summary of these basic system components and their communications requirements across four key characteristics:[8]

Device	**Frequency of Communications Signals**	**Amount of Data**	**Maximum Latency**	**Minimum Bandwidth**
SCADA	Every 3 to 6 seconds	256 bytes	2 seconds	2,400bps
Meter	Varies. For older technology, once per day. With smart meters, every 10 to 60 minutes.	3 – 18 kB	N/A	1,200bps
Relay	Weekly	1 kB	N/A	1,200bps
Fault Recorder	As needed	1 -3 MB	N/A	56kbps
SOE Recorder	As needed	1 MB	N/A	56kbps
VOIP	Daily, varies	Stream	250ms	56kbps
Video Surveillance	Constant	Stream	500ms	1,500kbps4

[8] Cooperative Research Network, *Internet Protocol in Electric Cooperative Applications – Communications System Summary* (Sept. 2005) at p. 2 (on file with author).

B. Question 1.b. Which communications technologies and networks meet these requirements?

As shown in responses to the above question, broadband is not absolutely required throughout the entire electric system, but it is necessary or will become so at certain critical points. Electric Co-ops are increasingly deploying data-rich SCADA systems, sensors, and intelligent electronic devices in addition to AMR/AMI (automatic meter reading/advanced metering infrastructure) systems. This data is typically collected at the substation, which means broadband at the substation is rapidly becoming a necessity. This data must then be transferred to headquarters or district offices to interface with other systems – customer information systems, outage management systems, etc. The two most common communications networks utilized by cooperatives at these points are fiber and private microwave, but the price of building and expanding both types of systems can be prohibitively expensive. A single microwave site can cost between $35,000 and $125,000 to construct, and often intermediate sites are required to form the end-to-end link between two locations. This type of network can provide very high bandwidth and reliability and is the preferred by many utilities.

Satellite data links can also provide relatively high-speed circuits to remote locations, although the latency (or end-to-end delay) of these circuits is often too high for normal voice traffic. The initial cost of a satellite network is relatively low, but the monthly lease cost for the service can be high. For these reasons, satellite is not as widely used.

Another type of wireless service that is beginning to catch on among Electric Cooperatives is digital cellular (or personal communications service, "PCS"). Electric Cooperatives near urban areas usually have good cellular coverage for most of their substations. Data rates can vary, but are usually at least as good as telephone circuits. PCS, being completely digital, can utilize encryption and error-correcting codes to make calls much clearer and nearly

impossible to intercept. The high security that PCS offers is especially attractive to Electric Co-ops for medium-bandwidth applications.

WiMax is a technology being closely watched by Electric Cooperatives, with some already adopting the technology. Its high-speed connectivity and flexibility (with mobile or fixed links) and relative affordability make it an attractive option, particularly for those Electric Co-ops who are well beyond the reach of PCS providers.

Wireless mesh networks are also being explored by numerous Electric Cooperatives. These networks are reliable, redundant and flexible, able to connect fixed and mobile devices and well suited for VOIP traffic. Wireless mesh networks are also resilient and a relatively inexpensive mode of medium-bandwidth communication. The problem however, has been the lack of standardization, with at one time nearly 80 competing communications protocols.

Last, but certainly not least, is Broadband Over Power Line ("BPL"). A number of Electric Cooperatives are working to deploy BPL systems. Many Electric Cooperatives have utilized the older power line carrier systems, which are narrowband, low-frequency systems with limited data-transfer capacity typically used for substation telemetry and control. More recent BPL applications utilizing its higher bandwidth are AMR, dynamic tariff control, load management, load profile recording, credit control, prepayment, remote connection, fraud detection, and network management. However, commercially deployable, high speed, long distance BPL requires further research.

C. Question 1.d. Are current commercial communications networks adequate for deploying Smart Grid applications? If not, what are specific examples of the ways in which current networks are inadequate?

D. Question 1.e. How reliable are commercial wireless networks for carrying Smart Grid data (both in last-mile and backhaul applications)? Are commercial wireless networks suitable for critical electricity equipment control communications?

Because these questions are closely related and the answered interwined, NRECA is

addressing them together in this section. At least three different reports have recognized that commercial networks are not as well suited to support the needs of CI as the private networks owned and operated by CI providers. First, as noted in previous comments,[9] the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks ("Independent Panel") concluded that electric utility networks, including their commercial wireless networks, "appeared to have a high rate of survivability following Katrina," unlike wireline telephone, cellular telephone, broadcasting and cable networks, which all suffered heavy damage.[10]

In its report, the Independent Panel cited several factors contributing to the high survivability of utility-owned communications networks (including utility-owned commercial wireless networks): designed to remain intact to aid restoration of electric service after a storm; built with significant onsite back-up power supplies; utility owned and controlled "last mile" connections to towers and backbone transport with redundant paths; and staff focus on continuing maintenance of network elements.[11]

Second, as further described by the Utilities Telecom Council, public and private networks have fundamental differences in their overall design philosophies:[12]

[9] See Reply Comments of the National Rural Electric Cooperative Association, In the Matter of A National Broadband Plan for Our Future, Docket No. 09-51, July 21, 2009

[10] *See* the Independent Panel Reviewing the Impact of Hurricane Katrina on Communications Networks, Report and Recommendations to the F.C.C. at 12 n.2 (June 12, 2006) ..

[11] Id at 12.

[12] The Utility Spectrum Crisis, A Critical Need to Enable Smart Grid, Utilities Telecom Council, (Jan. 2009) ("UTC Report"), available at http://www.utc.org/fileshare/files/3/Public_Policy_Issues/Spectrum_Issues/finalspectrumcrisisreport0109.pdf (last viewed on 10/1/2009). NRECA is a member of UTC and is also a member of UTC's Critical Infrastructure Communications Coalition which focuses on the telecommunications and information technology needs of critical infrastructure industries, especially electric, gas and water utilities.

Public/Commercial wireless systems:

i) Designed for coverage among maximum populations and density to improve profitability
ii) Constructed with limited tower site overlap
iii) Emphasizes low cost infrastructure implementations
iv) May or may not utilize the NTIA priority access protocol
v) Performs system maintenance independent of user's needs/requirements
vi) Limited talk group configurations (tens of participants).

Private systems:

1) Geographic coverage required regardless of the potential for financial return.
2) Site designed for overlap redundancy
3) Emphasizes power supply and connectivity redundancy
4) Priority of restoration. In other words, the network owner promptly restores it own critical communications first.
5) Control system maintenance schedules
6) Allows large talk group configurations (100's of participants)
7) Provide emergency alert functions

Both routine communications and critical communications during and following major events (storms, etc.) are necessarily impacted by the inherent differences of a public/commercial network. Most importantly, perhaps, is that utilities must have the assurance of priority restoration. Otherwise, power outages are extended, which may put public safety and property at risk.

Another concern with using commercial networks is that service providers typically do not provide service throughout a utility company's service territory. NRECA is aware of small Electric Cooperatives where six or seven different telecommunications providers operate within the electric service territory. Not only may this result in the need to interface disparate commercial systems, but utilities also typically have some wireless communication networks that would need to be connected, e.g. dispatch, mobile data, and SCADA systems.

Third, the National Telecommunications and Information Administration ("NTIA") in its 2002 report, Current and Future Spectrum Use by the Energy, Water, and Railroad Industries

("NTIA Report"),[13] generally noted that wireless commercial services cannot replace existing private wireless infrastructure. Limited coverage areas, no priority of services when outages occur, and cost of service are a few of the reasons cited by NTIA for why commercial services would not be able to replace utilities' private networks. However, the report recognized that commercial services are used to a great extent for non-critical, administrative communications.[14] Moreover, wireline systems cannot replace the wireless infrastructure that these utilities heavily rely on because, as NTIA noted, wireless systems are mobile, less expensive, more reliable, and easier to maintain than fiber or wire-based systems.[15]

In sum, with the federal government investing billions of taxpayer dollars in Smart Grid and broadband infrastructure, and with states and private industry poised to invest even more, it would be unwise to compromise the foundation of the electric grid by supporting it with commercial communications networks constructed for profit maximization and rapid deployment and which is not designed with the sole purpose of operating and protecting the electric distribution system.

NRECA urges the Commission to refrain from policies and practices that may speed deployment of broadband in the short term, but would effectively "engineer down" the safe and reliable electric distribution networks to the level of communication networks found to be inadequate by the Independent Panel. Thus, while NRECA firmly supports the FCC's development and implementation of a national broadband plan, the Commission should not assume that commercial networks can or should be "fixed" to meet the needs of electric utilities as they deploy Smart Grid technologies.

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[13] http://www.ntia.doc.gov/osmhome/reports/sp0149/sp0149.pdf ("NTIA Report").

[14] Id. at p. 80.

[15] Id.

III. SPECTRUM

In seeking to better understand how wireless spectrum is or could be used for Smart Grid applications, the Commission inquired whether the spectrum bands currently used by ***power utilities is adequate enough to meet the needs of*** Smart Grid communications and welcomed detailed studies and discussion showing that the current spectrum is or is not sufficient.[16]

The NTIA Report noted that "As a whole, the energy industry uses frequencies anywhere from 25 MHz to 25 GHz. Within this range, companies use point-to-point microwave systems, shared Industrial/Business Pool, and systems in VHF and UHF. . .These bands are used by systems that are needed to maintain radio communications throughout all stages of the exploration, production, distribution, maintenance, and restoration processes of energy companies."[17]

Unfortunately, because NTIA's report was based predominantly on public comments, and many commenters were not specific with regards to the frequency bands they use, NTIA could not quantify spectrum use or amounts thereof.[18]

A. Question 3.f. Is additional spectrum required for Smart Grid applications? If so, why are current wireless solutions inadequate?

There is no question that more data is required to definitively answer these difficult questions and NRECA commends the Commission for seeking quantitative answers in return. Above, in response to questions regarding the suitability of communications technologies, we described some of the challenges inherent with certain wireless options. We believe it will take more time to collect the data the FCC requires and NRECA is ready to assist the Commission in this endeavor.

[16] Notice at ¶ 3.

[17] NTIA Report at p. 45.

[18] Id at p. 80.

We also commend to the FCC the UTC Report, which extensively documents the spectrum needs and shortfalls utilities are facing. According to the UTC Report, electric, gas and water utilities in the United States need approximately 30 MHz of radio spectrum dedicated to their use to meet infrastructure needs and to help ensure reliable service for the next two decades.[19] In particular, the UTC Report explains how utilities need dedicated spectrum to ensure reliable service and faster restoration from emergencies and natural catastrophes as well as protect electric utility networks from cyber-based terrorist attacks.

In a recently conducted survey, UTC asked its members a series of questions regarding the degree to which utilities possessed suitable communications for reaching substations and customers.[20] NRECA commends UTC for the conducting its survey and compiling the data it received from 66 of its member utilities under the time constraints imposed by this Notice. While the representativeness of the survey sample cannot yet be confirmed, the respondents reported that a significant number of substations lack adequate communications capabilities. The respondents also reported that wireless communications networks are likely to be utilized for at least some of their electric grid operations and that while commercial services can be deployed for certain applications, reliable private wireless networks are preferred for critical utility applications.

NRECA agrees with UTC that implementing a highly reliable telecommunications network for the management and control of Smart Grids requires solutions capable of reaching the rural periphery of the electric distribution network and UTC proposal to reserve 30 MHz of

[19] Id. UTC proposes the harmonization of the U.S. with Canada, which has reserved the 1800-1830 MHz band to support its electric grid. In its NOI, the FCC sought comment on the policies or programs adopted by other nations that may be useful to the Commission in this proceeding. Perhaps the Commission should look first to the policies and programs of its largest trading partner and neighbor to the north – Canada. Industry Canada's initiative to provide a contiguous, nation-wide block of 30 MHz for smart grid operations is both large and flexible enough to serve the vast needs of growing systems and increasing wireless data loads. This proposal may serve as a model to the Commission as it seeks to implement a national broadband plan here.

[20] Utilities Telecom Council, Survey of Utility Communications Conducted by the Utilities Telecom Council in Preparation for the FCC's Public Notice Seeking Comment on the Implementation of Smart Grid Technology, (Oct. 2000) (on file with author).

spectrum for the control and maintenance of the electric grid is an important first step. Access to clear and reliable radio frequency spectrum is imperative for safe and reliable electric utility operations. However, if the FCC feels that more complete survey data is needed to confirm a specific amount of spectrum is required to fulfill the national purposes supported by the Smart Grid, then a comprehensive survey of the use of spectrum by utilities for Smart Grid applications should be undertaken and possibly coordinated with the Federal Energy Regulatory Commission, to coincide with FERC's annual assessment on advanced metering and demand response.

IV. CONCLUSION

NRECA appreciates the opportunity to comment on the Commission's National Broadband Plan NOI on the implementation of Smart Grid technology and looks forward to participating in the continuing dialogue on this important matter.

Respectfully submitted,

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